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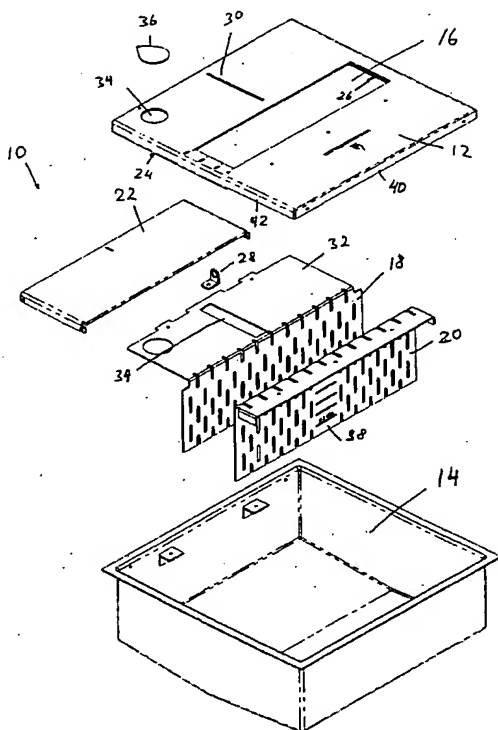
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[Continued on next page]

(54) Title: A BURNER FOR A HEATER



(57) Abstract: The present invention provides a burner (10) for a heater for combustion of a hydrocarbon liquid. The burner (10) comprises a combustion chamber having a combustion zone (17) for combusting the hydrocarbon liquid and at least one tank portion (13, 15) for containing an amount of the hydrocarbon liquid. The or each tank portion (13, 15) is positioned adjacent the combustion zone (17) and arranged to feed the hydrocarbon liquid into the combustion zone (17). The or each tank portion (13, 15) is at least in part filled with a filling material having a plurality of portions that pass through the interior of the or each tank portion (13, 15).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A BURNER FOR A HEATER

Field of the Invention

The present invention broadly relates to a burner for
5 a heater. The burner is arranged for combustion of a
hydrocarbon liquid.

Background of the Invention

Traditionally, heating of buildings such as private
10 homes involves gas, oil, wood and electric heaters.
Generally, wood heaters have the disadvantage that a flue
is required for exhaust fumes and that the wood needs to
be stored. In many dwellings such as apartments, units
and townhouses installation of a flue and storage of the
15 wood may cause problems or may not be possible at all.
Gas heaters have similar problems as a gas connection is
required. Oil heaters also need to be flued. Electrical
heaters are generally rather expensive to operate and
require electrical connections.

20 One interesting and largely environmentally clean
alternative is a heater that is arranged for combustion of
a hydrocarbon liquid such as an alcohol. For example, if
ethanol is combusted, the exhaust products are largely
limited to carbon dioxide and water steam.

25 A simple burner for ethanol has previously been used
to provide a heat source for a fireplace. This burner
comprises an open tank in which ethanol is combusted.
However, as ethanol and other hydrocarbon liquids are
easily combustible and may even be explosive if in vapour
30 form or mixed with air, there is a need for a burner for a
hydrocarbon liquid that provides improved safety.

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Summary of the Invention

The present invention provides in a first aspect a burner for a heater for combustion of a hydrocarbon liquid, the burner comprising:

5 a combustion chamber having a combustion zone for combusting the hydrocarbon liquid and at least one tank portion for containing an amount of the hydrocarbon liquid, the or each tank portion being positioned adjacent the combustion zone and being arranged to feed the
10 hydrocarbon liquid into the combustion zone, the or each tank portion being at least in part filled with a filling material having a plurality of portions that pass through the interior of the or each tank portion.

15 A combustible gas over the surface of the hydrocarbon liquid typically needs to have a temperature above a threshold value to ignite. The filling material typically is arranged for distribution of at least some of the heat that is in use developed in the combustion zone and
20 directed into the or each tank portion whereby local heat maxima in the tank portion are reduced and thereby likelihood of ignition in the tank portion is reduced. Further, as typically burning of the hydrocarbon liquid in the tank portion is avoided, fuel efficiency is also
25 increased.

 For example the filling material may comprise a large number, such as more than one hundred or more than one thousand particles which define spaces between them. Alternatively, the filling material may comprise a mesh or
30 gauze such as a mesh or gauze of wires or fibres or a metallic wool such as steel wool. The filling material may comprise a metallic material, a plastics material, a mineral or any other suitable material. The steel wool may

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be stainless steel wool which has superior corrosion properties compared with conventional steel wool.

The heater may be a heater for heating at least a portion of a building such as a commercial space or a home. For example, the burner may form a part of a fireplace.

The burner typically comprises a combustion control means for controlling gas exchange of the combustion in the combustion zone.

For example, the control means may comprise an opening that allows diffusion of oxygen into the combustion chamber and a closure for the opening. This particular arrangement has the advantage that operation of the flame of the burner may be extinguished at any time by simply closing the opening and thereby interrupting the supply of oxygen required for the combustion. This feature therefore provides a further significant safety advantage.

The control means may also be arranged to regulate the oxygen diffusion into the combustion chamber so as to regulate the combustion properties of the burner. This feature therefore allows the regulation of the heat and flame output and of the consumption of the hydrocarbon liquid.

For example, the combustion control means may comprise a shutter that is arranged to adjust the opening and/or close the opening so that combustion may be controlled and/or to extinguish a flame in the combustion zone. The combustion chamber may comprise a lid portion in which the opening is positioned and the shutter may be arranged to slide across the opening of the lid portion. The shutter typically is guided by a guide and moveable relative to the opening typically in a straight direction. The shutter may also be connected to the combustion

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chamber by a hinge that allows the sliding movement. In this case, the hinge may be arranged for movement about a vertical axis.

Alternatively, the shutter may be moveable relative to the opening in a direction that has a vertical component. In this case the hinge typically is arranged for movement about a horizontal axis.

The shutter may be positioned inside the combustion chamber and may be arranged for sliding across an inner surface of the lid portion. In a specific embodiment the shutter and the lid portion are arranged so that the shutter may not interfere with objects located on the burner. Further, a mechanism that may be associated with the shutter may be positioned so that it cannot easily be accessed from the outside of the combustion chamber which further improves the safety of the burner. Further, the shutter may comprise rollers which are guided by guides in the lid portion and which improve the smoothness of the sliding motion when the shutter is moved and thereby reduce likelihood of spark formation.

In order to reduce the likelihood of jamming of the shutter, a portion of the shutter that in use is in contact with the lid portion may comprise a material that is softer than the lid portion which it contacts.

In one specific embodiment the shutter is arranged so that, when the opening is closed, the lid portion overlaps the shutter. Because of the overlap, the likelihood of oxygen diffusion into the combustion chamber with an amount sufficient for combustion is further reduced which further improves the safety of the burner. Further, the shutter may comprise a handle portion that in use projects through a slot of the lid portion and the burner may be arranged so that movement of the handle portion along the

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slot effects sliding of the shutter across the opening of the lid portion. The chamber may be configured such that oxygen diffusion through the slot is substantially inhibited.

5 The combustion chamber may comprise stainless steel and the softer material may be brass. Spacers may be positioned at an external portion of the burner arranged for positioning between the burner and an item that supports the burner so that direct contact of the burner
10 with the item is avoided and the item may comprise a combustible material such as a timber material. For example, the burner with the spacers may be arranged for positioning in the combustible material. The burner may also comprise a tray in which the burner is positioned and
15 which is arranged to avoid direct contact with the combustible material.

 The heater typically is arranged for positioning in an item so that at least a portion of the burner is positioned below a surface of the item. For example, the
20 heater may be arranged for positioning in the item so that the surface of the item is approximately at the same level as a top portion of the combustion chamber. The heater may be arranged for positioning in a fireplace or any other building portion or in a furniture item such as a table.
25 The heater typically does not have any connections such as fuel lines and typically is arranged for manual refilling. This has the particular advantage that it is relatively easy to install the heater in a building. Further, typically no flue is required.

30 The combustion chamber may comprise a fuel inlet opening through which the hydrocarbon liquid may be filled into the or each tank portion of the combustion chamber. The fuel inlet opening is typically remote from the

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opening of the combustion control means.

Further, the fuel inlet opening may comprise a closure, such as a shutter, and the burner may be arranged so that, when the shutter of the combustion control means is fully open, the shutter of the fuel inlet opening is closed and only when at least a portion of the shutter of the combustion control means is closed the fuel inlet opening is fully open. In a specific embodiment the shutter of the combustion control means and the shutter of the fuel inlet means are provided in form of an integral part.

The fuel inlet opening may also comprise a grid through which the hydrocarbon liquid is filled into a tank portion. The grid functions to reduce the likelihood of formation of air pockets in the hydrocarbon liquid during filling and formation of air bubbles when the fuel is filled into the tank portion.

In a specific example the combustion chamber comprises two tank portions between which the combustion zone is positioned. In this example the combustion zone is located underneath the opening of the combustion control means. The tank portions are separated from the combustion zone by wall portions that comprise apertures to allow the fuel to penetrate from the tank portions into the combustion zone.

The burner may be arranged for the combustion of any hydrocarbon liquid including any type of alcohol. In a specific embodiment the burner is arranged for the combustion of ethanol or methylated spirits which has the advantage that the combustion is largely environmentally friendly.

The present invention provides in a second aspect a heater comprising the above-defined burner.

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The present invention provides in a third aspect a
a heater for combustion of a hydrocarbon liquid, the
burner comprising:

a combustion chamber having a combustion zone for
5 combusting the hydrocarbon liquid and at least one tank
portion for containing an amount of the hydrocarbon
liquid, the or each tank portion being positioned adjacent
the combustion zone and being arranged to feed the
hydrocarbon liquid into the combustion zone,
10 and a fuel inlet portion having a closure, and
a combustion control means for controlling gas
exchange of the combustion zone through an gas exchange
opening of the combustion chamber

wherein the closure of the fuel inlet opening is
15 arranged so that filling of the fuel into the or each tank
portion is only possible if the combustion control means
closes at least a portion of the gas exchange opening of
the combustion chamber.

20 The combustion control means typically comprises a
shutter for controlling the gas exchange through the gas
exchange opening of the combustion chamber. The closure of
the fuel inlet opening typically also includes a shutter.
Typically the shutter for controlling gas and the shutter
25 of the fuel inlet opening are coupled and may also be
integrally formed.

The invention will be more fully understood from the
following description of a specific embodiment. The
description is provided with reference to the accompanying
30 drawings.

Brief Description of the Drawings

Figure 1 is (a) a side-view, (b) a further side-view,

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(c) a top-view and (d) a perspective view of a burner for a heater according to a specific embodiment,

Figure 2 is a perspective and exploded view of components of the burner shown in Figure 1.

5

Detailed Description of a Specific Embodiment

Referring to Figures 1 and 2 the burner for a heater according to a specific embodiment is now described. In this embodiment the burner 10 comprises a lid portion 12 and a body portion 14. The lid portion 12 and body
10 portion 14 are composed of stainless steel. The lid portion 12 has an opening 16 below which the combustion zone 17 of the burner is located.

In this embodiment, the combustion zone 17 is
15 positioned between two tank portions 13 and 15 of the burner and stainless steel walls 18 and 20 separate the tank portions 15 and 17 from the combustion zone 17. The walls 18 and 20 have apertures 19 which allow the hydrocarbon liquid to penetrate from the tank portions 15
20 and 17 into the combustion zone 17. The tank portions 15 and 17 are filled with stainless steel wool (not shown) which distributes heat and reduces likelihood of ignition in the tank portions 15 and 17 and thereby reduces
25 It will be appreciated that in alternative embodiments the burner may take any other suitable form. For example, the burner may comprise one or more than two tank portions.

Further, the tank portions may be filled with any material that conducts heat and that allows fuel to be
30 stored in the tank portions. Alternative examples any type of metal wool (not necessarily stainless) and a large number of small particles such as metal balls. Further the material with which the tank portions are filled may not

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necessarily be metallic but may comprise a non-metallic material.

In this embodiment, the burner 10 is arranged for the combustion of ethanol or methylated spirits which has the advantage that the combustion is largely environmentally friendly.

The burner also comprises a shutter 22 that is guided by guides 24 and 26. The shutter 22 has a handle portion 28 that projects through a slot 30 of the lid portion 12. By moving the handle portion 28 along the slot 30 the shutter adjusts the opening 16 and thereby controls the exchange of oxygen and exhaust through the opening 16 (and also controls the convection of oxygen within the combustion chamber). This allows to control heat output of the burner and the fuel consumption.

Further, the shutter may fully close opening 16 so that the penetration of oxygen into the combustion chamber is substantially stopped whereby the flame in the combustion zone is extinguished. The shutter 22 is larger than the opening 16 so that in a closed position the shutter 22 overlaps lid portion 12 from the inside and, due to the overlap, the likelihood of diffusion of an amount of oxygen into the combustion chamber that is sufficient for combustion is further reduced.

Wall portion 18 comprises a flat portion 32 which has a recess portion 34 positioned underneath handle portion 28 and slot 30 so as to prevent diffusion of oxygen through the slot into the interior of the burner 10.

In this embodiment the shutter 22 comprises brass rollers (not shown) which are received by guides 24 and 26 so that during sliding of the shutters the rollers roll in guides 24 and 26 which reduces friction. Further, as the rollers are composed of brass which is a soft material,

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likelihood of jamming is reduced.

It will be appreciated that in alternative embodiments the shutter may take any other form and shape. For example, the shutter may be hingetly connected to the
5 body portion 14 or to the lid 12 portion. Alternatively, the shutter may be a lid that is removable from the body portion lid.

The lid portion 12 comprises a fuel inlet opening 34 which has an internal grid (not shown) through which
10 during a fuel filling process fuel penetrates and which reduces likelihood of formation of air pockets in the fuel. The shutter 22, the opening 34 and the opening 16 are arranged so that, when shutter 22 opens fuel inlet opening 34, the shutter 22 closes at least a portion of
15 opening 16 and thereby reduces the flame in the combustion zone which improves the safety during filling the hydrocarbon liquid into the burner 10. Further, fuel inlet opening 34 has a lid 36 and in this specific embodiment wall 20 has a scale that functions as a fuel
20 level indicator.

In this embodiment the burner is largely composed of stainless steel (the exception being the brass rollers of the shutter 22) which resists corrosion. However, in variations of the embodiment the burner may be composed of
25 any other suitable metallic or non-metallic material and may also comprise ceramics materials.

The body 14 has a V-shaped bottom portion 38 and therefore gravity permits the direction of the hydrocarbon liquid to the combustion zone. The lid portion 12 has lips
30 40 and 42 which are arranged to be slidingly received by the interior of the body portion 14 and thereby provide a largely oxygen diffusion tight connection with the body portion 14.

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The burner 10 may also comprise spacers (not shown) such as brackets that allow the burner to be installed into a combustible medium such as a timber plate. In this case the spacers may be arranged to inhibit direct contact
5 of the combustion chamber and the combustible medium. The burner 10 typically is arranged for insertion into a cavity of an item such as a portion of a building, eg a fire place, or a furniture item such as a table. Typically an upper edge of the burner 10 is flush with a surface of
10 the item.

Although the invention has been described with reference to particular examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms. For example, the burner may
15 be arranged for the combustion of any hydrocarbon liquid. Further, the burner may have any volume, size and shape including for example round, rectangular and triangular shapes.

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The Claims:

1. A burner for a heater for combustion of a hydrocarbon liquid, the burner comprising:
 - 5 a combustion chamber having a combustion zone for combusting the hydrocarbon liquid and at least one tank portion for containing an amount of the hydrocarbon liquid, the or each tank portion being positioned adjacent the combustion zone and being arranged to feed the
 - 10 hydrocarbon liquid into the combustion zone, the or each tank portion being at least in part filled with a filling material having a plurality of portions that pass through the interior of the or each tank portion.
- 15 2. The burner as claimed in claim 1 wherein the filling material is arranged for distribution of at least some of the heat that is in use developed in the combustion zone and directed into the or each tank portion whereby local heat maxima in the tank portion are reduced and thereby
- 20 likelihood of ignition in the tank portion is reduced.
3. The burner as claimed in claim 1 or 2 wherein the filling material more than one hundred particles which define spaces between them.
- 25 4. The burner as claimed in claim 1 or 2 wherein the filling material comprises a mesh.
5. The burner as claimed in claim 1 or 2 wherein the
- 30 filling comprises a mesh gauze.
6. The burner as claimed in claim 1 or 2 wherein the filling material comprises a steel wool.

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7. The burner as claimed in any one of the preceding claims wherein the filling material comprises a metallic material.

5

8. The burner as claimed in any one of the preceding claims being a part of a fireplace.

9. The burner as claimed in any one of the preceding claims comprising a combustion control means for controlling gas exchange of the combustion in the first combustion zone.

10. The burner as claimed in claim 9 wherein the control means comprises an opening that allows diffusion of oxygen into the combustion chamber and a closure for the opening.

11. The burner as claimed in claim 10 wherein the combustion control means may comprises a shutter that is arranged to adjust the opening so as to control the combustion the combustion zone.

12. The burner as claimed in claim 10 or 11 wherein the shutter is arranged to close the opening so as to extinguish a flame in combustion zone.

13. The burner as claimed in claim 12 wherein the shutter is arranged so that, when the opening is closed, the lid portion overlaps the shutter.

30

14. The burner as claimed in any one of the preceding claims comprising spacers positioned adjacent an external portion of the burner and arranged to avoid direct contact

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between the burner and an item that supports the burner.

15. The burner as claimed in any one of the preceding
claims comprising a tray in which the burner is positioned
5 and which is arranged to avoid direct contact between the
burner and an item that supports the burner.

16. The burner as claimed in claim 14 or 15 wherein the
item is combustible.

10

17. The burner as claimed in any one of the preceding
claims arranged for positioning in an item so that at
least a portion of the burner is positioned below a
surface of the item.

15

18. The burner as claimed in any one of the preceding
claims arranged for positioning in a fireplace.

19. The burner as claimed in any one of the preceding
20 claims arranged for positioning in a furniture item.

20. The burner as claimed in any one of the preceding
claims wherein the combustion chamber comprises a fuel
inlet opening through which the hydrocarbon liquid may be
25 filled into the or each tank portion of the combustion
chamber.

21. The burner as claimed in claim 20 wherein the fuel
inlet opening is remote from the opening of the combustion
30 control means.

22. The burner as claimed in claim 20 or 21 wherein the
fuel inlet opening comprises a closure.

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23. The burner as claimed in claim 10 or in anyone of claims 11 to 22 when dependent on claim 10 being arranged so that, when the shutter of the combustion control means is fully open, the shutter of the fuel inlet opening is closed and only when at least a portion of the shutter of the combustion control means is closed the fuel inlet opening is fully open.

24. The burner as claimed in claim 23 wherein the shutter of the combustion control means and the shutter of the fuel inlet means are provided in form of an integral part.

25. The burner as claimed in any one of the preceding claims comprising two tank portions between which the combustion zone is positioned.

26. The burner as claimed in claim 24 wherein the tank portions are separated from the combustion zone by wall portions that comprise apertures to allow the fuel to penetrate from the tank portions into the combustion zone.

27. A heater comprising the burner as claimed in any one of claims 1 to 26.

25

28. A burner for a heater for combustion of a hydrocarbon liquid, the burner comprising:

a combustion chamber having a combustion zone for combusting the hydrocarbon liquid and at least one tank portion for containing an amount of the hydrocarbon liquid, the or each tank portion being positioned adjacent the combustion zone and being arranged to feed the hydrocarbon liquid into the combustion zone,

30

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and a fuel inlet portion having a closure, and
a combustion control means for controlling gas
exchange of the combustion zone through an gas exchange
opening of the combustion chamber

5 wherein the closure of the fuel inlet opening is
arranged so that filling of the fuel into the or each tank
portion is only possible if the combustion control means
closes at least a portion of the gas exchange opening of
the combustion chamber.

10

29. The burner as claimed in claim 28 wherein the
combustion control means typically comprises a shutter for
controlling the gas exchange through the gas exchange
opening of the combustion chamber and wherein the closure
15 of the fuel inlet opening also includes a shutter.

30. The burner as claimed in claim 29 wherein the
shutter for controlling gas and the shutter of the fuel
inlet opening are coupled.

1/2

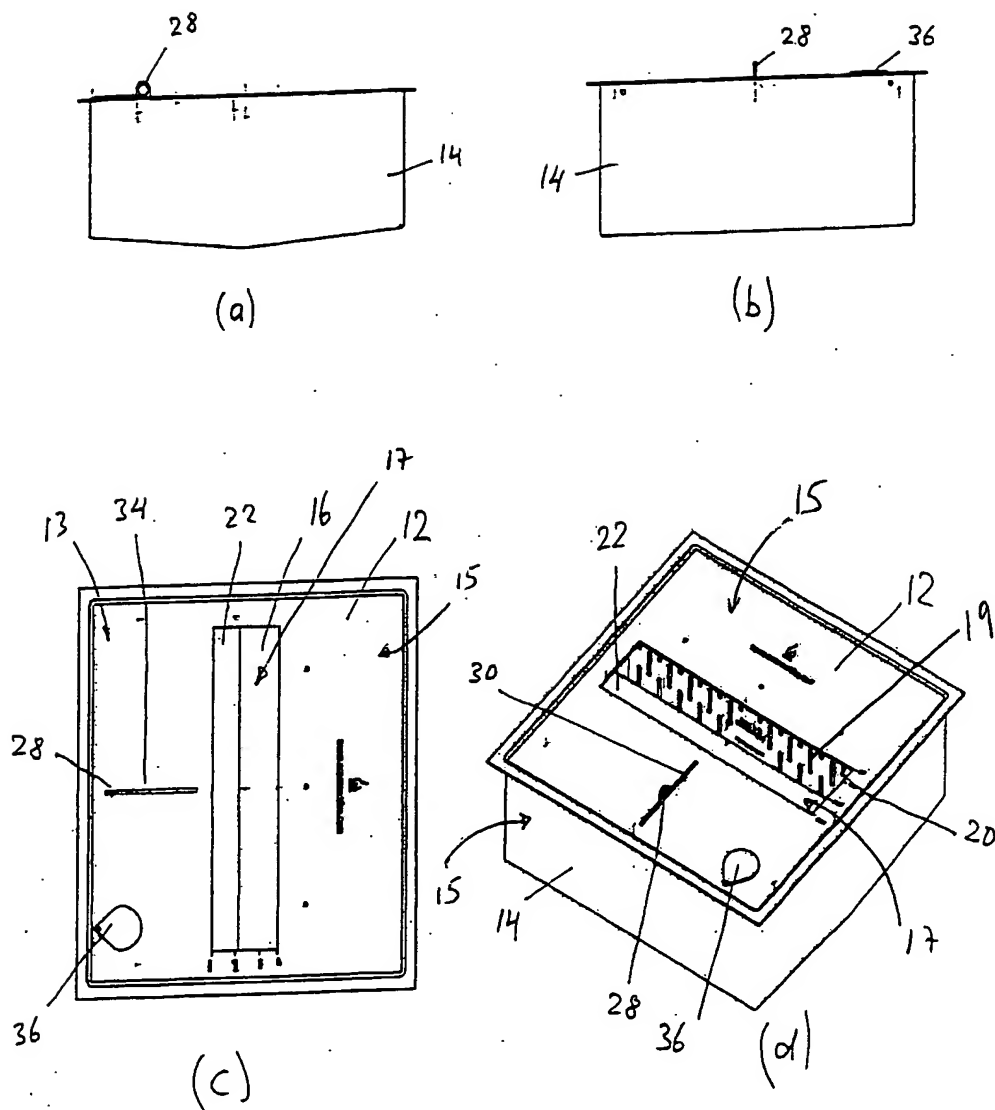


FIG. 1

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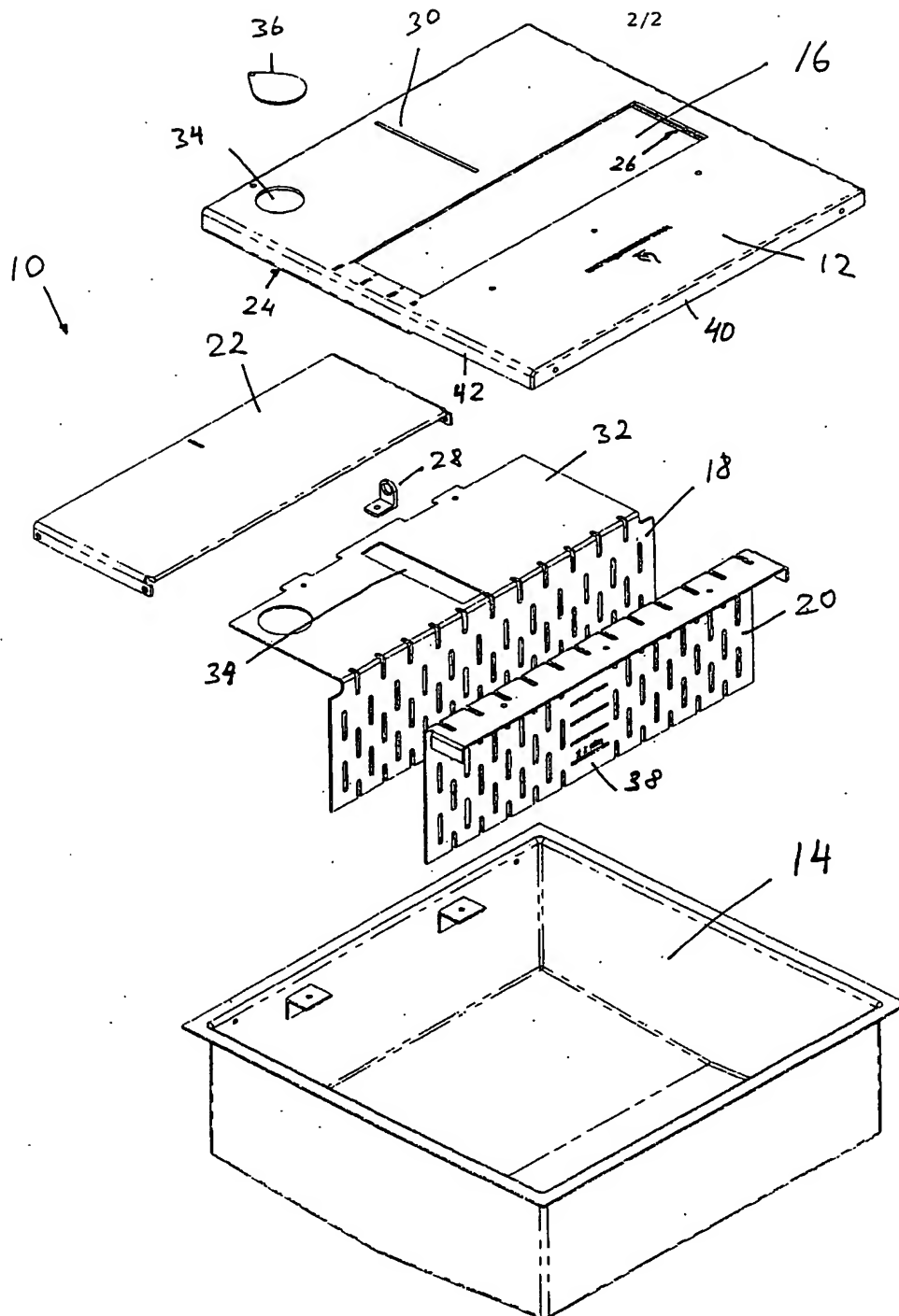


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/001467

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ⁷: F23D 5/12, F23L 1/00, 1/02, 7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F23D 5/-, F23L 1/-, 7/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI: F23D 5/- OR F23L 1/- OR 7/- and Keywords (Alcohol or Liquid or Ethanol or Methanol or Methylat+ or Spirit+ or Oil+)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X Y | US 4416617 A (EBBESON, BENGT E. O.) 22 November 1983 Whole document | 1, 3-7, 20-22 1-27 |
| Y | CA 2193896 A (DAOUST, GILLES) 24 June 1998 Whole document | 1-27 |
| Y | US 4170981 A (HAKATA, YOSHIHISA ET AL) 16 October 1979 Whole document | 1-27 |

☐

Further documents are listed in the continuation of Box C

☒

See patent family annex

- | | |
|---|---|
| <p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> |
|---|---|

Date of the actual completion of the international search
30 November 2004

Date of mailing of the international search report
- 3 DEC 2004

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/001467

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/001467

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1 -27 relate to a burner for a heater which is designed to burn hydrocarbon liquid in which the hydrocarbon liquid storage tank contains a plurality of portions. It is considered that the use of the plurality of portions within the storage tanks comprises a first "special technical feature".
2. Claims 28-30 relate to a burner for a heater which is designed to burn hydrocarbon liquid where in addition to a combustion chamber and at least one storage tank there is a fuel inlet portion having a closure, a combustion control means for regulating gas exchange where when the fuel inlet is open so that fuel can be added the combustion control means closes at least a portion of the gas exchange opening. It is considered that the use of a fuel inlet portion and combustion control means that are linked such that when one is open the other is at least partially closed comprises a second "special technical feature".

These groups are not so linked as to form a single general inventive concept, that is, they do not have any common inventive features, which define a contribution over the prior art. The common concept linking together these groups of claims is a burner for combusting hydrocarbon liquid comprising a combustion chamber and at least one hydrocarbon liquid storage tank separate but adjacent to the combustion chamber. However this concept is not novel in the light of many prior art citations including as an example US 4416617. Therefore these claims lack unity a posteriori.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2004/001467

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report | | | | Patent Family Member | | | |
|---|---------|----|----------|----------------------|----------|----|----------|
| US | 4416617 | CA | 1117390 | DE | 2953502 | EP | 0029425 |
| | | GB | 2063456 | JP | 56500188 | SE | 8100391 |
| | | SE | 8102698 | SE | 8102699 | WO | 8001602 |
| CA | 2193896 | US | 5881709 | | | | |
| US | 4170981 | DE | 2714734 | JP | 52120071 | JP | 52120072 |
| | | JP | 52120073 | JP | 53015764 | | |
| Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. | | | | | | | |
| END OF ANNEX | | | | | | | |